Apple II Hardware: Direct Memory Access (2/97)

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Security: Everyone

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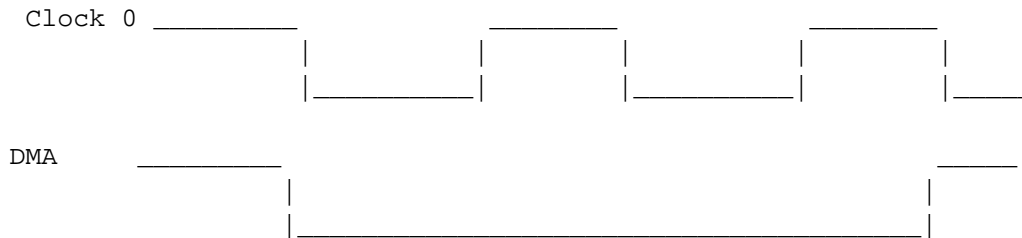

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TOPIC ---

This article describes DMA (Direct Memory Access) and how it can be used to
control the Apple's memory and I/O.

DISCUSSION --

DMA (Direct Memory Access), is designed to allow the hardware on an interface
card to completely take over the Apple's memory and I/O. The DMA pin on the
Apple II interface bus disconnects the Apple's 6502 from the Apple's address
bus, data bus, R/-W signal, and clock. The DMA pin should be pulled low
immediately after phase 0 goes low and should be released when phase 0 again
goes low. The 6502 is a dynamic device that will lose its registers' memory if
DMA is held low for more that 40 microseconds. Here is an example where the DMA
lasts for two microseconds.

```
 Clock 0 _____           _____           _____
              |          |           |        |           |        |
              |_____|           |_____|           |_____|_____

 DMA       _____                                      _____
              |                                         |
              |_____|
```

The 6502 normally sets up its addresses, control, and data while clock 0 is low.
The memory or I/O device decodes and readies the data while clock 0 is high. The
actual transfer occurs when clock 0 goes from high back to low. During cycles
when DMA is low, the user must supply the address, control, and data information
for that memory cycle in synchronization with the Apple's clocks.

Enabling Unlimited DMA
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* Point the reset vector to a restart routine, assuming the Apple has the Auto-Start ROM.

* Have the peripheral card generate a RESET when the 6502 is to have control of the bus. The Apple II Reference Manual explains the RESET vector starting on page 36.

Article Change History:
28 Feb 1997 - Reviewed for technical accuracy, revised formatting.

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